

# Abstracts

## Oral 8

### Occupational cancer II

#### 08.1 GENDER DIFFERENCES OF BLADDER CANCER RISK IN SPANISH TEXTILE WORKERS

C. Serra<sup>1,2</sup>, M. Kogevinas<sup>3</sup>, D. Turuguet<sup>3</sup>, F. Fernandez<sup>3</sup>, P. Stewart<sup>4</sup>, N. Malats<sup>3</sup>, D. Silverman<sup>4</sup>, N. Rothman<sup>4</sup>, A. Tardon<sup>5</sup>, R. Garcia-Closas<sup>6</sup>, A. Carrato<sup>7</sup>, G. Castaño-Vinyals<sup>3</sup>, M. Dosemeci<sup>4</sup>. <sup>1</sup>Pompeu Fabra University, Barcelona, Spain; <sup>2</sup>Corporació Parc Taulí, Sabadell, Spain; <sup>3</sup>Municipal Institute of Medical Research, Barcelona, Spain; <sup>4</sup>National Cancer Institute, Bethesda, USA; <sup>5</sup>Universidad de Oviedo, Spain; <sup>6</sup>Hospital Universitario de Canarias, Tenerife, Spain; <sup>7</sup>Hospital General de Elche, Spain

**Introduction:** Several occupations and exposures within the textile industry in Spain have been found to be associated with bladder cancer. Compared with other industries, a relatively high proportion of women is employed in textiles. We explored whether there are any differences of the risk of bladder cancer between men and women who worked in the textile industry.

**Methods:** We conducted a hospital based case control study in Spain between 1998 and 2001, including 1226 cases of bladder cancer and 1271 controls (87% males). Lifetime occupational history was recorded through a computer assisted personal interview and exposures in the textile industry were assessed by a detailed modular questionnaire. Occupations, specific locations, tasks, and materials used within the industry were recorded. We did stratified analysis by sex and odds ratios (OR) and 95% confidence intervals (CI) were adjusted for age, region, other high risk occupations, and smoking.

**Results:** Among a total of 248 identified textile workers 49 (20%) were women. Occupations with a high proportion of women were tailors (55%), spinners (32%), and weavers (25%). Risk estimates for bladder cancer were higher for women than men for all major textile occupations with sufficient numbers of women and for exposures associated with bladder cancer, such as: spinners (OR women 2.1 v OR men 0.8), weavers (3.9 v 1.4), tailors (1.3 v 0.8); working in the winding (7.9 v 1.3) or warping/sizing/dressing (4.1 v 2.3) sections, the weaving room (3.5 v 1.3), and for those exposed to cotton (2.0 v 1.3) or synthetic material (3.4 v 1.5). Interaction was non-significant. When the analysis was restricted to never smokers (82 textile workers), a similar pattern was observed, although 95% CI were wider.

**Conclusions:** These data raise the hypothesis that women working in the textile industry may have a higher risk of bladder cancer than men working in the same industry, even when having similar occupations and/or exposures.

#### 08.2 PANCREATIC CANCER MORTALITY AMONG BELORUSSIAN TANNERY WORKERS

I. Veyalkin. *Department of Environmental Medicine, International Sakharov Environmental University, Minsk, Belarus*

**Introduction:** Factors associated with pancreatic cancer are controversial and may be presented in many different occupations. Basing on some literature data we can suppose that chromium compounds can promote cancer of pancreas. In this connection we decided to focus our attention to study pancreatic cancer cases among workers occupied at Minsk leather tannery, where exposure of chromium could be considered high.

**Methods:** The cohort of 768 died workers was retrospectively followed from 1 January 1953 to 31 December 2000. There were 328 women and 440 men observed. Proportionate mortality ratios (PMRs) were calculated using the Minsk City population mortality proportions to generate expected numbers. The ability of leather dust to liberate chromium compounds after pepsin and pancreatin digestion was estimated with chemical methods.

**Results:** In total cohort we established 13 cases of pancreatic cancer: eight females (significant PMR=313% 95% CI 135 to 620) and five males (insignificant PMR=195% 95% CI 60 to 430). The analysis in details showed that six of eight female pancreatic cancer deaths were

occurred in workers of dyeing-stuffing and decorating workshops (PMR=366%; 95% CI 134 to 800). Seven workers were hired since 1961 till 1976 and were dismissed since 1962 till 1984 (PMR=654%; 95% CI 262 to 1347). Also significantly high PMR was shown for five workers with the observed experience 120–240 months (PMR=858; 95% CI 278 to 2000). Four of eight workers were dismissed within 1962–66 (PMR=2222%; 95% CI 1604 to 5689) and four within 1978–84 (PMR=1600%; 95% CI 435 to 4097). All of them were directly occupied in leather production processes with high air exposure to leather dust and formaldehyde. Additionally we showed that after pepsin and pancreatin digestion 1 g of stained leather dust could liberate about 0.27 mg chromium III ions.

**Conclusion:** Pancreatic cancer in tannery workers could be initiated by some chemicals used at the tannery in 1962–66 and in 1978–84 (presumably formaldehyde and Direct Black 3 dye were liberated from swallowed leather dust after pepsin and pancreatin digestion. Chromium III ions could promote this effect.

#### 08.3 INCIDENCE OF TESTICULAR TUMOURS IN A COHORT OF CAR MANUFACTURING WORKERS

W. Ahrens<sup>1</sup>, W. Schill<sup>1</sup>, A. Gottlieb<sup>1</sup>, J. Weiß<sup>2</sup>, W. Dahlke<sup>2</sup>, B. Marschall<sup>2</sup>. <sup>1</sup>Bremen Institute for Prevention Research and Social Medicine, University Bremen, Germany; <sup>2</sup>Volkswagen AG, Wolfsburg, Germany

**Introduction:** A practitioner had observed several testicular tumours in the automobile industry which raised suspicion of an occupational cause. This study examined whether the incidence rate of male germ cell tumours is actually increased in the cohort of car manufacturing workers.

**Methods:** The cohort includes 167 212 men, who were active between 1989 and 2000 in six plants. 251 patients were identified. Work phases were grouped according to time spent in different departments of the plant. Age and period specific incidence rates of the Saarland for testicular cancer served as reference for the calculation of standardised incidence ratios (SIRs). Hazard ratios for internal comparisons between work areas were estimated by Cox regression.

**Results:** The study confirmed the increased incidence in Plant A (SIR 2.3; 95% CI 1.70 to 3.01). For the entire cohort, the standardised incidence rate was 14.10 (SEGI, 15–69 years), compared with an incidence rate of 10.60 in the reference population, implying a statistically significant increased SIR of the cohort of 1.26 (95% CI 1.12–1.43). The excess risk was pronounced in older employees aged 50–59 years (SIR 1.7; 95% CI 1.09 to 2.57; n=21) and particularly in workers aged 60–69 years (SIR 10.4; 95% CI 5.58 to 19.26; n=10). The internal comparison showed elevated risks in the work areas office work (HR 1.54; 95% CI 1.06 to 2.24), tool manufacture (HR 1.90; 95% CI 1.18 to 3.05), and machine support (HR 2.22; 95% CI 1.14 to 4.33).

**Conclusions:** The assumed increased incidence was confirmed by our analysis. The excess in older workers is compatible with a possible occupational cause. Explorative evaluation by work areas provides hints that will be investigated in a nested case control study, in consideration of the role.

#### 08.4 BLADDER CANCER IN PERFLUOROCTANESULFONYL FLUORIDE MANUFACTURING WORKERS

B. H. Alexander<sup>1</sup>, G. W. Olsen<sup>2</sup>. <sup>1</sup>School of Public Health University of Minnesota, Minneapolis MN USA; <sup>2</sup>3M Company, St Paul, USA

**Introduction:** As a follow up to a cohort mortality study of perfluorooctanesulfonyl fluoride (POSF) manufacturing workers that found an excess risk of death from bladder cancer (SMR=13) in workers with high perfluorooctanesulfonate (PFOS) exposure, a study to ascertain all cases of bladder cancer in the cohort was conducted.

**Methods:** A postal questionnaire with telephone follow up was administered to living members (n=1895) of the cohort to ascertain any history of bladder cancer. Validation of cancers through medical records was pursued. Death certificates of decedents were obtained and coded for underlying and contributing cause of death. Standardised incidence ratios (SIR) of bladder cancer were calculated using expected population based rates for the US. The risk of bladder cancer was estimated between workers with varying degrees cumulative PFOS exposure based on a job history data matrix.

**Results:** The questionnaires were returned by 1400 (74%) of the cohort members presumed alive during the study period, of which 1137 were men and 263 were women. One hundred and eighty eight cohort members were identified as deceased. A total of 11 cases of primary bladder cancer cases were identified from the surveys (n=6) and death certificates (n=5). The age, sex, and calendar period adjusted standardized incidence ratio (SIR) for the entire cohort was 1.28 (95% CI 0.64 to 2.29). The SIR for ever working (n=6), and working for more than a year (n=3) in a high exposed job were 1.74 (95% CI 0.64 to 3.79) and 1.12 (95% CI 0.23 to 3.27) respectively. Compared to employees in the lowest quartile of cumulative exposure the odds ratio for bladder cancer was 1.3, (95% CI 0.2 to 7.9), 1.7 (95% CI 0.9 to 5.3), and 1.5 (95% CI 0.3 to 8.4).

**Conclusion:** Overall, the results of this study do not confirm the high risk of bladder cancer in this PFOS exposed population. However, the possibility remains for a smaller risk (approximately 1.5- to twofold) in the higher exposed workers, but the limited size of the population prohibits a conclusive exposure response analysis.

### 08.5 MULTIPLE CANCERS AMONG WORKERS EXPOSED TO RED, GREY, AND BLACK GRANITE DUST

R-S. Koskela<sup>1</sup>, P. Mutanen<sup>1</sup>, J-A. Sorsa<sup>1</sup>, M. Klockars<sup>2</sup>. <sup>1</sup>Department of Epidemiology and Biostatistics, Institute of Occupational Health, Topeliuksenkatu 41 a A, FIN-00250 Helsinki, Finland; <sup>2</sup>Department of Public Health, University of Helsinki, Finland

**Introduction:** The earlier cancer morbidity study of the three different granite areas, combined with differences in the biological activity of granite dusts pointed to the direct role of quartz in cancer induction. The aim of this study was to investigate an association of silica dust exposure with multiple cancers.

**Methods:** The study comprised 1026 Finnish granite workers employed in quarries and processing yards in the red, grey, and black granite areas. Cancer morbidity was followed from the Finnish Cancer Register in the years 1953–2002. The statistical methods were person-year analysis and Poisson regression.

**Results:** Both the red and grey granite contain about 40% quartz, black granite does not contain quartz. The quartz particles in grey granite are smaller and rougher than the quartz in red granite. The follow up of lung cancer in 1987 showed that 25 cases were from the red granite area (15.4 exp, SIR 162, 95% CI 105 to 240), 17 cases were from the grey granite area (9.4 exp, SIR 181, 95% CI 105 to 290), and one came from the black granite area (0.5 exp). The latency was shorter in the grey granite area (p<0.01). By the end of 2002, 169 cancer cases were observed. Of them 58 were lung cancer cases, 37 from the red granite area, 20 from the grey granite area, and one from the black granite area. The histopathology of the 58 cases differed for the red and grey granite areas: squamous carcinomas were more numerous among the red granite cases (38% against 20%), whereas small cell carcinomas (including anaplastic carcinomas) were more frequent among the grey granite cases (22% against 50%). Twenty of the 169 people with cancer had multiple cancers, 14 from the red granite, and six from the grey

granite area. The mean cumulative exposure to respirable silica (mg/m<sup>3</sup> years) in the red granite area was 25.6 for the multiple cancer cases, 16.7 for the single cancer cases, and 12.6 for the non-cancer cases. The figures for the grey granite area were 10.5, 11.6, and 9.4, respectively. The differences in exposure were even greater for the multiple and single cancer cases of the lung and the bladder.

**Conclusion:** The results suggest that the carcinogenic effect of silica targets different sites that may result in multiple cancers.

### 08.6 EXPOSURE TO SILICA DUST AND LUNG CANCER MORTALITY AMONG SILICOTIC WORKERS IN HONG KONG: EXPOSURE-RESPONSE ANALYSES

I. T. S. Yu, L. A. Tse. Department of Community and Family Medicine, The Chinese University of Hong Kong, HK SAR, People's Republic of China

**Introduction:** The aim of this study is to examine the exposure-response relation between various indices of silica dust exposure and the mortality of lung cancer among a cohort of 2789 silicotic workers.

**Methods:** A simple job exposure matrix was developed for each industry and job task according to documented concentrations of respirable silica dust in Hong Kong. The changes of exposure levels with calendar year were not considered because of limited hygiene data. Exposure indices included duration of silica dust exposure, cumulative silica exposure, mean dust concentration, and radiological severity of silicosis. Cox's proportional hazard models were fitted with SAS programs to detect a wide range of possible exposure-response patterns, including log linear, log square root, log quadratic, power, and cubic smoothing spline models, with adjustment for confounding factors—age at entry into cohort, smoking pack-years, and types of dusty trades. The changes of -2 ln likelihood were used to compare model fit between models. The standardised mortality ratio (SMR) for lung cancer was also calculated. The indirect method proposed by Axelson and Steenland was used to adjust for the confounding factor of smoking.

**Results:** During the follow up period 1981–99, about 10% (86) of all 853 deaths were from lung cancer, giving a SMR of 1.69 (95% CI 1.35 to 2.09). The SMR of lung cancer for caisson workers (with concomitant exposures to radon) and surface construction workers was 2.39 (95% CI 1.50 to 3.62) and 1.61 (1.21 to 2.10) respectively, which became 1.56 (95% CI 0.98 to 2.36) and 1.09 (95% CI 0.82 to 1.42) after adjusting for smoking indirectly. Results from multivariate Cox's models using different exposure-response patterns did not show a consistent relation between various exposure indices and the mortality of lung cancer. No particular model seemed to provide the "best fit" in the exposure-response analyses. Cigarette smoking was a significant predictor in all the models evaluated. Silicotics with large opacities and those ever employed in underground caisson showed a moderate but insignificant increase in the mortality of lung cancer.

**Conclusion:** This study provides little evidence on a link between silica, silicosis, and lung cancer after taking into consideration concomitant occupational exposure to other lung carcinogens and the confounding effects of cigarette smoking.